

## DATA ON THE BIOLOGY OF *ALOPECOSA PSAMMOPHILA* BUCHAR 2001 (ARANEAE, LYCOSIDAE)

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**ABSTRACT.** This paper presents electron micrographs of the genitalia of *Alopecosa psammophila*, describes the morphological characteristics of the species and also gives information on its habitat preference, the co-occurring ground-dwelling spiders, and the phenological characteristics of the species. Barber pitfall trappings have been carried out since 2000 in dry sandy grasslands in three regions of Hungary: the Kiskunság area (Kiskunság National Park); the Nyírség area (Hortobágy National Park); and since 2004 the Kisalföld area (Fertő-Hanság National Park). Specimens of the species, hitherto unknown in Hungary, have been collected from 17 localities in all three areas. We collected specimens in calciferous open sand steppes and in acidic open sand steppes. In the females, two activity periods were apparent (from April to end July and in October). A few males were collected in April and in October–November they had an extreme activity peak. We assume that the species has adult specimens throughout the winter. *Alopecosa psammophila* is most similar to *Xysticus nimi* Thorell, 1872 and *Zelotes longipes* (L. Koch 1866) in terms of its environmental needs.

**Keywords:** Wolf spider, sandy grasslands, palpal organ, phenology, habitat preference

The species *Alopecosa psammophila* Buchar 2001 is known only from warm and dry sandy habitats of southern Moravia and from southern Slovakia (Buchar 2001). On the basis of the habitat characteristics of the holotype, and because they were found so close to Hungary, it was highly likely that the species would occur in Hungary, as dry sandy grasslands occur in large areas in the Carpathian Basin.

The ultimate goal of the investigations into Hungarian sandy grasslands was to explore the biology of the species in precise details. We wished to focus primarily on the phenological characteristics, the habitat preference and the co-occurring spiders. In addition we also wished to publish pictures of the genitalia of the Hungarian specimens taken using a scanning electron microscope, as only drawings of the species have hitherto been known in the international literature (Buchar 2001).

### METHODS

Barber pitfall trappings have been carried out in nine sandy grasslands in the Kiskunság area (Kiskunság National Park—coordinates

of the central site of the study area (Fülöpháza) Lat. 19°24' N, Long. 46°52' E) and eight sandy grasslands in the Nyírség area (Hortobágy National Park—coordinates of the central site of the study area (Bátorliget) Lat. 47°42' N, Long. 17°47' E) since 2000 as part of the project "Monitoring grasslands," itself part of the national program Biodiversity Monitoring. The appropriate processing of the specimens collected in 2000 in the 170 ground traps, operated throughout the entire vegetation season with 10 traps in each of the 17 habitats, provided us with an ample opportunity to examine the occurrence of *Alopecosa psammophila*.

In addition to the two large regions under investigation since 2000, we commenced similar investigations in the sandy grasslands of the Small Hungarian Plain (Kisalföld, part of the Fertő-Hanság National Park—coordinates of the central site of the study area (Gönyű) Lat. 47°40' N, Long. 20°14' E), which lies in the northwestern part of the country. Figure 1 of Central Europe shows the type locality of the species, its habitat in Slovakia (Buchar 2001), as well as the sampling sites in Hungary.



Figure 1.—The occurrence of the *Alopecosa psammophila* in Central Europe. ■ = the type locality; ▲ = sampling site in Slovakia; ● = sampling sites in Hungary. 1● = Kiskunság National Park: 9 different study sites; 2● = Nyírség region: 8 different study sites; 3● = Small Hungarian Plain (Kisalföld).

In the Kiskunság area we also paid close attention to the characteristics of the habitats. This way we had the opportunity to explore the relationship between the abundance of *A. psammophila* and the environmental variables including size of the habitat investigated, average open sand surface, average coverage of lichens and mosses, average coverage of the sand and mosses, average coverage of the leaf-litter, average coverage of vegetation, average vegetation height. We used multiple regression models to evaluate the effects of the seven variables on the number of individuals (Barta et al. 2000). For investigating which species have the closest habitat association with *Alopecosa psammophila* we used hierarchical cluster analysis (Tóthmérész 1993). The electron micrographs were made in the Hungarian Natural History Museum, Budapest (dr. Krisztina Buczkó) with a HITACHI SN 2600 scanning electron microscope. The voucher specimens are deposited in the collection of HNHM.

## RESULTS

**Morphology.**—Figs. 2–5 show electron micrographs of the genitalia of the Hungarian specimens. In both male and female genitalia



Figures 2–5.—Genitalia of *Alopecosa psammophila*. 2. Left male palp, ventral view.

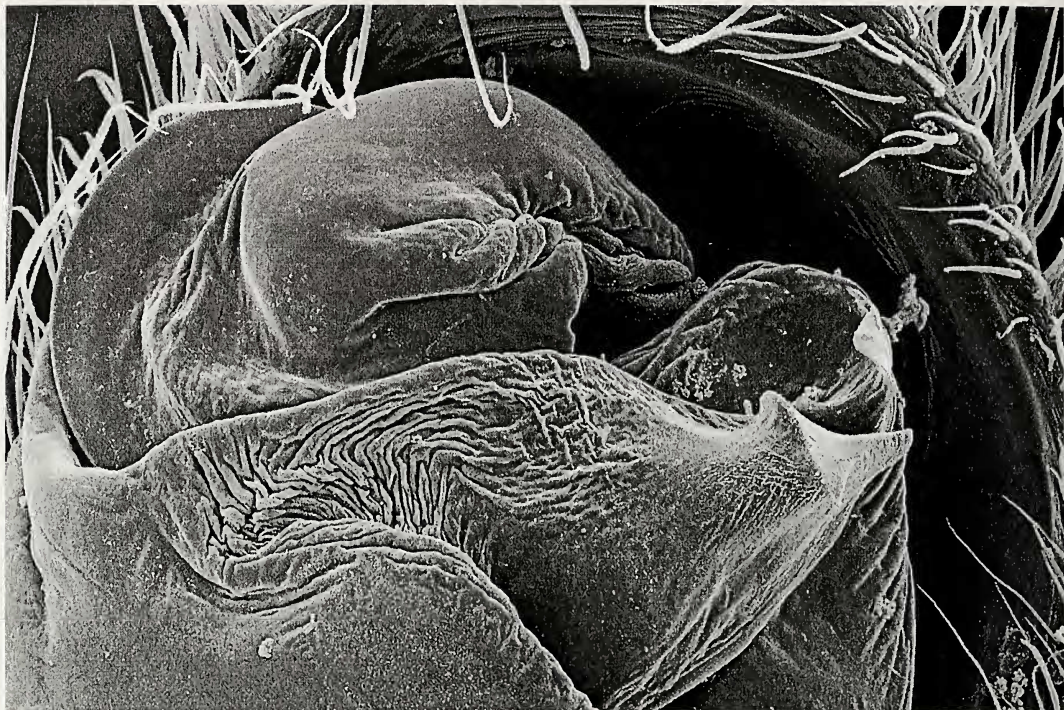


Figure 3.—Tegular apophysis and apical division.

the three-dimensional structure of the organs carries the specific information that allows the recognition of the species. In the male palp the spear shape of the tegular apophysis can be understood by mentally combining the ventral (Fig. 2–3.) and retrolateral (Fig. 4) views.

**Occurrence in Hungary.**—This species, hitherto unknown to Hungary, has been collected from 17 different habitats (sampling sites) in the three different areas. The 17 habitats examined yielded specimens of the species from 12 and 11 locations in 2001 and 2002, respectively. The species occurred in 16 out of the 17 Hungarian sandy grasslands investigated. Add to this the sandy grasslands in the Kisalföld area which also yielded specimens of the species.

**Phenology.**—In the collection period between the beginning of April and the beginning of November 2001 (the longest collection period within one calendar year), 46 females and 54 males were collected. In the case of the females, two activity periods were evident. The first period lasted from April to the end of July, culminating in the second half of May (Fig. 6). The peak coincided with the collection dates published by Buchar (2001).

We also collected males in April, which also coincided with Buchar's (2001) observations. In summer and early autumn periods there were no males in the samples, but in the second half of October and in November there was an extreme activity peak of males. We assume that the species has adult specimens throughout the winter. The November (2004) trappings also yielded males at Gönyű (Small Hungarian Plain).

**Habitat preference.**—We collected the specimens in the calciferous open sand steppes (*Festucetum vaginatae danubiale*) in the area between the rivers Danube and Tisza and on the Small Hungarian Plain, and in the acidic open sand steppes of the Nyírség area (*Festuco vaginatae-Corynephorretum*). We can conclude that the species is generally widespread in the ground-dwelling fauna of any dry sandy grassland in the Carpathian Basin. However, we were unable to find any significant relationships between its presence/absence or its relative abundance and the measured characteristics of the flora of the grasslands investigated (non-significant effects of all seven variables), apart from it being a very strong indicator of sand.



Figure 4.—Same as Fig. 3, retrolateral view.

**Spider communities.**—Sandy grasslands seem to have rather similar spider communities all over Hungary. These communities were characterised by specialist psammophilous species and were basically unaffected by wide regional separation and/or sand type. The dominant species at the study sites included *Alopecosa cuneata* (Clerck, 1757); *Alopecosa cursor* (Hahn, 1831); *Alopecosa sulzeri* (Pavesi, 1873); *Berlandina cinerea* (Menge, 1872); *Callilepis nocturna* (Linnae-

us, 1758); *Gnaphosa mongolica* Simon, 1895; *Thanatus arenarius* Thorell, 1872; *Thanatus pictus* L. Koch, 1881; *Zelotes longipes* (L. Koch, 1866). *A. psammophila* was the dominant species at one sampling site and ranked second, third, fourth, fifth or lower at other sites. The average relative frequency of *A. psammophila* was considerably higher in the Kiskunság National Park ( $0.12 \pm 0.14$  (mean  $\pm$  SD)) than in the Nyírség area ( $0.04 \pm 0.05$ ), but its dominance status was very variable



Figure 5.—Epigynum, ventral view.

even within one region. For the cohabiting species that were present at least at 50% of all the sampling sites (5 locations), we carried out an association test. The results suggest that out of the cohabiting species *A. psammophila* shows the closest relationship with *Xysticus ninnii* Thorell 1872 and *Zelotes longipes* (L. Koch 1866) as far as their environmental needs are concerned (Fig. 7).

## DISCUSSION

Morphologically, *Alopeccosa psammophila* can be well distinguished from the other *Alopeccosa* species in Central Europe by the highly specific three-dimensional shape of its genitalia. Phenologically, it is noted that the species shows the greatest activity in October and November. The co-occurring species of the genus (*A. cursor*, *A. cuneata* and *A. sulzeri*) have their maturity season in the summer. An exception to this is *Alopeccosa accentuata* (Latreille, 1817) which similarly to *A. psammophila* overwinters as adults; thus it has adult specimens in autumn, in spring and in early summer (Nentwig et al. 2003). On the basis of the investigations carried out so far, we conclude that *A. psammophila* is a species generally and frequently occurring in the sandy grasslands of Hungarian plains in the Carpathian Basin, and that it can even be the dominant species of the ground-dwelling spider communities in these habitats. In the case of sandy grasslands in the plains we found great differences in the coverage of vegetation, coverage of lichens and mosses, cover-

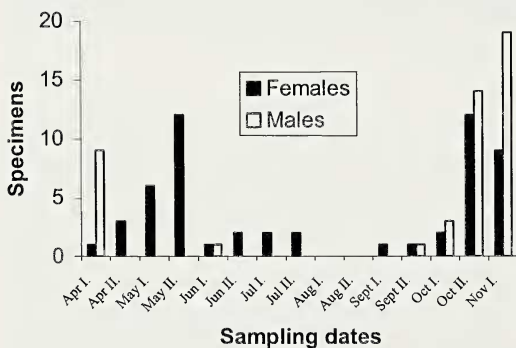


Figure 6.—Phenology of *Alopeccosa psammophila* based on pitfall samples collected at Fülöpháza in 2001.

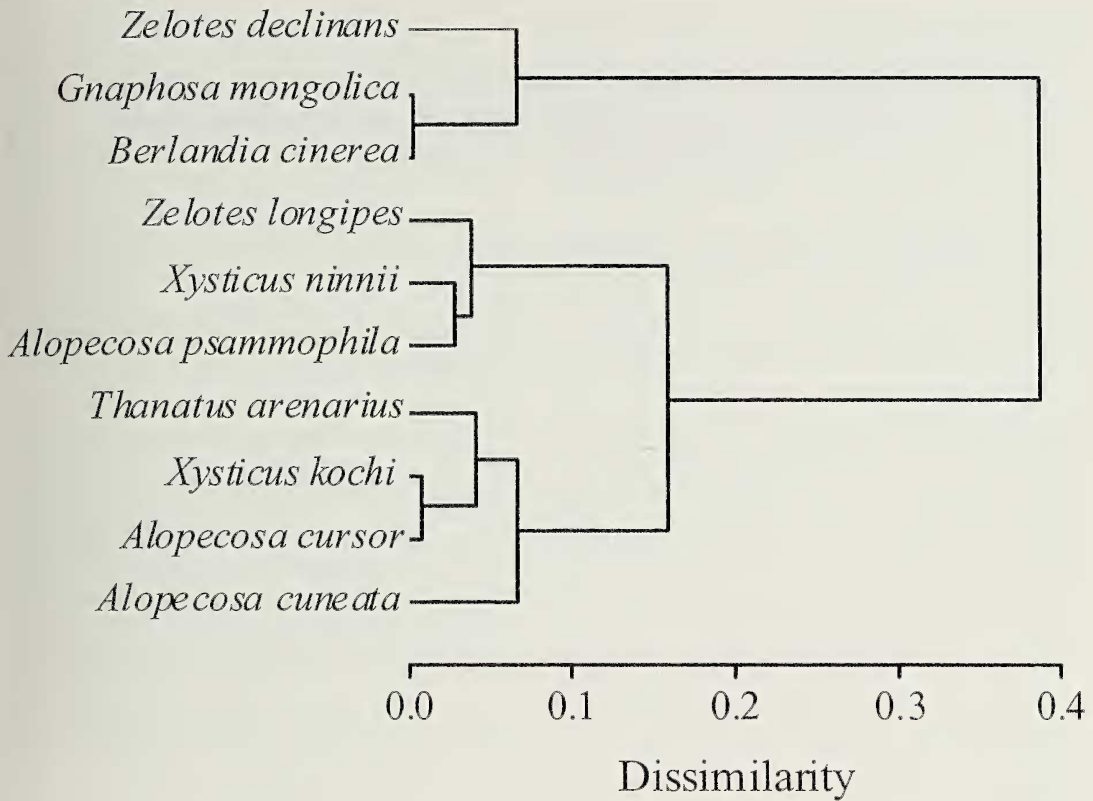


Figure 7.—The species in the closest association with *Alopecosa psammophila* in the Great Hungarian Plain (the Matusita index of similarity and the Ward-Orlóczi fusion method were used).

age of the sand and mosses, and in vegetation height, but these differences seemed not to affect the abundance of *A. psammophila*. We assume that the species is widespread in the dry sandy grasslands of Central Europe.

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